REMARKS

The Office Action mailed June 17, 2005, has been received and reviewed. Entry of the above amendment to the specification, which updates Government Rights in the Present Application, is respectfully solicited. No new matter has been added. Claims 1 through 85 are currently pending in the application. Claims 1 through 85 stand rejected. Applicants have amended claims 1, 5, 6, 21, 24-26, 36, 39-41, 52, 53, 61, 62, 73, 81, 82 and 85, and respectfully request reconsideration of the application as amended herein.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 5,801,489 to Chism, Jr. et al. in view of U.S. Patent No. 4,282,393 to Williamson

Claims 1 through 4, 18 through 25, 34 through 39, 50 through 60, and 73 through 75 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chism, Jr. et al. (U.S. Patent No. 5,801,489) in view of Williamson (U.S. Patent No. 4,282,393). Applicants respectfully traverse this rejection, as hereinafter set forth.

> M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:
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> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

The 35 U.S.C. § 103(a) obviousness rejections of the claims are improper because the references relied upon by the Examiner fail to teach or suggest all of the limitations of the presently claimed invention and because there is a lack of motivation to combine the references in the manner proposed by the Examiner.

Claims 1 through 4 and 18 through 23

Independent claim 1 is directed to a plasma generating apparatus. As amended herein the plasma generating apparatus of claim 1 comprises: a chamber; a first set of electrodes comprising three electrodes, wherein each electrode of the first set of electrodes is configured to be coupled to a single phase of a three phase alternating current (AC) power supply, the three electrodes of the first set of electrodes being circumferentially disposed about a longitudinal axis of the chamber; and at least another set of electrodes comprising three electrodes, wherein *each electrode of the at least another set of electrodes is configured to be coupled to a single phase of another three phase alternating current (AC) supply, the three electrodes of the at least another set of electrodes being circumferentially disposed about the longitudinal axis of the chamber,* and wherein *the at least another set of electrodes is displaced along the longitudinal axis relative to the first set of electrodes.*

The Examiner cites Chism as teaching "three phase energization of the plasma" while expressly acknowledging that Chism fails to disclose "multiple sets of electrodes in multiple zones." (Office Action, page 2). The Examiner cites Williamson as teaching that it is "conventional in a plasma furnace to have multiple sets of staggered electrodes in a three-phase connection." (Office Action, pages 2-3). The Examiner then concludes that "it would have been obvious to modify the patent to Chism, Jr. et al to use multiple sets of electrodes connected to the three phase power supplies, as claimed, to enable a more uniform, efficient and longitudinally maintained heating zone." (Office Action, page 3). Applicants respectfully traverse this rejection.

Chism discloses a plasma generator that includes a housing (31) defining a chamber (40), a low-voltage plasma oscillator (34) and three primary electrodes (33a-33c) that are spaced circumferentially around the chamber. The electrodes are configured as bent, conductive tubes having a coolant circulating therethrough. An annular pneumatic ring (35) is disposed inside the housing having a plurality of concentric holes formed therein. (Col. 3, lines 13 – 22). The holes are stated to be preferably drilled tangentially so that the working gas, introduced into the chamber through such holes, "is directed to flow in a clockwise direction to create a highly turbulent gas flow, with the relatively cooler gas closer to the walls of the chamber." (Col. 3,

lines 51-57). Chism states that the tangential arrangement "also allows the gas to blow around the electrodes 33a-c evenly from all sides." (Col. 3, lines 63-65). Additionally, this arrangement is asserted to lead to efficiencies in the system, particularly with regard to cooling issues as it is stated that the injected working gas "tends to force the plasma away from the walls of the chamber." (Col. 5, lines 10-12).

An arc is initiated among the primary electrodes by introducing a highly ionized gas into the gap therebetween, the ionized gas having been produced by the high voltage oscillator (34) and discharged from the oscillator nozzle (47). (Col. 3, line 66 – col. 4, line 14).

Williamson discloses a glass melting furnace having three groups of electrodes. Each group of electrodes represents a zone of the furnace. For example, in one embodiment described by Williamson, a first zone includes electrodes A1, B1, A4 and B4; a second zone includes electrodes B2, C2, B5 and C5; and a third zone includes electrodes A3, C3, A6 and C6. (See, FIG. 1). The electrodes of each zone are arranged in a substantially square pattern and the flow path within the furnace is indicated by an arrow in the drawings to flow across the zones concurrently or in parallel in the described embodiment. While the Examiner cites Williamson as teaching multiple sets of electrodes, it is noted that Williamson teaches a very specific arrangement regarding the physical arrangement of the electrodes as well as the electrical configuration thereof.

Particularly, Williamson describes two transformers (T1 and T2) that are both connected to a three phase electrical supply. The output terminals of the transformers are connected to electrode pairs such that each leg/phase of the transformer output is connected to *one electrode pair* of *each of the three zones* (see, e.g., FIGS. 1 and 3). The physical and electrical configuration of these electrode groups is stated to minimize undesirable currents such that the groups or zones of electrodes may be physically placed in a relatively close proximity to each other. (Col. 2, lines 24-57).

Applicants submit that the proposed combination of Chism and Williamson fails to teach or suggest all of the limitations of claim 1 of the presently claimed invention. For example, Chism and Williamson fail to teach or suggest at least another set of electrodes comprising three electrodes, wherein *each electrode* of the at least another set of electrodes is configured to be

coupled to a *single phase* of *another three phase alternating current (AC) supply*. Rather, as set forth hereinabove, Williamson, which the Examiner relies on as teaching multiple sets of electrodes, teaches a specific arrangement of electrodes and power supplies wherein the output terminals of the transformers are connected to electrode pairs such that each leg/phase of the transformer output is connected to one discrete electrode pair of each of the three zones.

Additionally, Chism and Williamson fail to teach or suggest that the three electrodes of the at least another set of electrodes are *circumferentially disposed about the longitudinal axis of the chamber* and also *displaced along the longitudinal axis relative to the first set of electrodes*. Again, while the Examiner relies on Williamson as teaching multiple sets of electrodes arranged in zones, Williamson does not teach or suggest that the electrodes of one zone are circumferentially arranged about a longitudinal axis of a chamber, while the electrodes of another zone are likewise circumferentially arranged about the longitudinal axis of a chamber while also being displaced along the longitudinal axis relative to the first set of electrodes.

Moreover, Applicants submit that there is a lack of motivation for combining the references in the manner proposed by the Examiner. It is noted that, in order to arrive at the claimed invention, the physical and electrical arrangement of Williamson would have to be substantially modified such that each of the electrodes of one zone would be coupled with individual phases of one three phase AC supply, while the electrodes of another zone would be coupled with individual phases of a different three phase AC supply. Such would render the furnace of Williamson inadequate for its intended purpose as Williamson's specifically disclosed arrangements are expressly described as enabling the close spacing of the different zones while minimizing unwanted current paths between such zones.

Therefore, besides failing to teach or suggest all of the limitations of claim 1 of the presently claimed invention, Applicants submit that one of ordinary skill in the art would not be motivated to combine Chism and Williamson in the manner proposed by the Examiner.

As such, Applicants submit that claim 1 is clearly allowable over Chism and Williamson. Applicants further submit that claims 2 through 4 and 18 through 23 are also allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claims 21 and 22, Applicants submit that Chism and Williamson fail to teach or suggest that the electrodes each include a first metallic tubular member and a second metallic tubular member, wherein the second metallic tubular member is disposed within the first metallic tubular member and wherein the first and second tubular members are sized, located and configured to define an annular gap therebetween.

With respect to claim 22, Applicants submit that Chism and Williamson fail to teach or suggest an inlet in fluid communication with an interior portion of the second tubular member and an outlet in fluid communication with the annular gap.

With respect to claim 23, Applicants submit that Chism and Williamson fail to teach or suggest that each electrode further includes an electrode tip removably coupled with at least one metallic tubular member.

Applicants, therefore, respectfully request reconsideration and allowance of claims 1 through 4 and 18 through 23.

Claims 24, 25 and 34 through 38

Independent claim 24 is directed to an arc generating apparatus. As amended herein the arc generating apparatus of claim 24 comprises: a first set of electrodes comprising three electrodes, wherein each electrode of the first set of electrodes is configured to be coupled to a single phase of a three phase alternating current (AC) power supply, the three electrodes of the first set of electrodes being circumferentially disposed about a defined axis; and at least a another set of electrodes comprising three electrodes, *wherein each electrode of the at least another set of electrodes is configured to be coupled to a single phase of another three phase alternating current (AC) supply, the three electrodes of the at least another set of electrodes being circumferentially disposed about the defined axis, and wherein the at least another set of electrodes is displaced from to the first set of electrodes along the defined axis.*

The Examiner cites Chism as teaching "three phase energization of the plasma" and states that Chism fails to disclose "multiple sets of electrodes in multiple zones." (Office Action, page 2). The Examiner cites Williamson as teaching that it is "conventional in a plasma furnace to have multiple sets of staggered electrodes in a three-phase connection." (Office Action, pages 2-

3). The Examiner then concludes that "it would have been obvious to modify the patent to Chism, Jr. et al to use multiple sets of electrodes connected to the three phase power supplies, as claimed, to enable a more uniform, efficient and longitudinally maintained heating zone." (Office Action, page 3). Applicants respectfully traverse this rejection.

As set forth hereinabove, Chism discloses a plasma generator that includes three primary electrodes (33a-33c) that are spaced circumferentially around the chamber, the electrodes being configured as bent, conductive tubes having a coolant circulating therethrough. An annular pneumatic ring, having a plurality of concentric holes formed therein, is disposed inside the housing of the plasma generator. (Col. 3, lines 13 – 22). The annular ring is configured to direct flow of a working gas in a clockwise direction to create a highly turbulent gas flow, to allow the gas to blow around the electrodes evenly from all sides, (see, e.g., col. 3, lines 63-65), and to force the plasma away from the walls of the chamber (see, e.g., col. 5, lines 10-12). An arc is initiated among the primary electrodes by introducing a highly ionized gas into the gap therebetween, the ionized gas having been produced by a high voltage oscillator. (Col. 3, line 66 – col. 4, line 14).

As also discussed hereinabove, Williamson discloses a glass melting furnace having three groups of electrodes, each group of electrodes representing a zone of the furnace. The electrodes are arranged in a very specific manner regarding both the physical and the electrical configurations of the electrodes.

Particularly, Williamson describes two transformers (T1 and T2) that are both connected to a three phase electrical supply. The output terminals of the transformers are connected to electrode pairs such that each leg/phase of the transformer output is connected to one electrode pair of each of the three zones (see, e.g., FIGS. 1 and 3). The physical and electrical configuration of these electrode groups is stated to minimize undesirable current paths so that the groups or zones of electrodes may be physically placed in a relatively close proximity to each other. (Col. 2, lines 24-57).

Applicants submit that the proposed combination of Chism and Williamson fails to teach or suggest all of the limitations of claim 24 of the presently claimed invention. For example, Chism and Williamson fail to teach or suggest at least another set of electrodes comprising three

electrodes, wherein *each electrode of the at least another set of electrodes* is configured to be coupled to a *single phase* of *another three phase alternating current (AC) supply*. Rather, as set forth hereinabove, Williamson, which the Examiner relies on as teaching multiple sets of electrodes, teaches a specific arrangement of electrodes and power supplies wherein the output terminals of the transformers are connected to electrode pairs such that *each leg/phase of the transformer output is connected to one discrete electrode pair for each of the three zones*.

Additionally, Chism and Williamson fail to teach or suggest that the three electrodes of the at least another set of electrodes are *circumferentially disposed about the defined axis* and also *displaced from the first set of electrodes along the defined axis*. Again, while the Examiner relies on Williamson as teaching multiple sets of electrodes arranged in zones, Williamson does not teach or suggest that the electrodes of one zone are circumferentially arranged about a defined axis, while the electrodes of another zone are likewise circumferentially arranged about the defined axis while also being displaced from the first set of electrodes along the defined axis.

Moreover, Applicants submit that there is a lack of motivation for combining the references in the manner proposed by the Examiner. It is noted that, in order to arrive at the claimed invention, the physical and electrical arrangement of Williamson would have to be substantially modified such that each of the electrodes of one zone would be coupled with individual phases of one three phase AC supply, while the electrodes of another zone would be coupled with individual phases of a different three phase AC supply. Such would render the furnace of Williamson inadequate for its intended purpose as Williamson's specifically disclosed arrangements are expressly described as enabling the close spacing of the different zones while minimizing unwanted current paths between such zones.

Applicants, therefore, respectfully submit that claim 24 is allowable over Chism and Williamson. Applicants further submit that claims 25 and 34 through 38 are also allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claim 25, Applicants submit that Chism and Williamson fail to teach or suggest that each electrode of the first set of electrodes is configured to be radially displaced relative to the defined axis.

With respect to claim 24, Applicants submit that Chism and Williamson fail to teach or suggest that the electrodes are formed of a material comprising graphite. While the Examiner states that use of graphite for an electrode is "an obvious choice for the artisan" (Office Action, page 3), Applicants submit that there is a lack of motivation to modify Chism's electrodes in the manner proposed by the Examiner. As stated by Chism, the specific configuration described thereby "allows the use of a material for electrodes 33a-c having a relatively low melting point but high thermal conductivity, such as copper." (Col. 4, lines 21-22). Applicants submit that one of ordinary skill in the art would, therefore, lack motivation to modify the electrodes of Chism so as to form them from a material comprising graphite. Moreover, Applicants submit that one of ordinary skill in the art would lack motivation to modify Chism's electrodes in such a manner based on the difficulty in forming the electrodes from graphite, configured as shown and described by Chism, as compared to fabricating them from a metal such as copper.

With respect to claims 36 and 37, Applicants submit that Chism and Williamson fail to teach or suggest the electrodes each including a first metallic tubular member and a second metallic tubular member, wherein the second metallic tubular member is disposed within the first metallic tubular member and wherein the first and second tubular members are sized, located and configured to define an annular gap therebetween.

With respect to claim 37, Applicants submit that Chism and Williamson fail to teach or suggest an inlet in fluid communication with an interior portion of the second tubular member and an outlet in fluid communication with the annular gap.

With respect to claim 38, Applicants submit that Chism and Williamson fail to teach or suggest that each electrode further includes an electrode tip removably coupled with at least one metallic tubular member.

Applicants, therefore, respectfully request reconsideration and allowance of claims 24, 25 and 34 through 38.

Claims 39 and 50 through 52

Independent claim 39 is directed to a plasma arc reactor. As amended herein the plasma arc reactor of claim 39 comprises: a first chamber section; at least another chamber section

wherein the first chamber section and the at least another chamber section are configured and located to at least partially define a chamber body; a first set of electrodes comprising three electrodes disposed at least partially within the first chamber section, wherein each electrode of the first set of electrodes is configured to be coupled to a single phase of a three phase alternating current (AC) power supply, the three electrodes of the first set of electrodes being circumferentially disposed about a longitudinal axis of the chamber body; and at least another set of electrodes comprising three electrodes disposed at least partially within the at least another chamber section, wherein *each electrode of the at least another set of electrodes is configured to be coupled to a single phase of another three phase alternating current (AC) supply, the three electrodes of the at least another set of electrodes being circumferentially disposed about the longitudinal axis of the chamber body, and wherein the at least another set of electrodes is displaced along the longitudinal axis relative to the first set of electrodes.*

The Examiner cites Chism as teaching "three phase energization of the plasma" and states that Chism fails to disclose "multiple sets of electrodes in multiple zones." (Office Action, page 2). The Examiner cites Williamson as teaching that it is "conventional in a plasma furnace to have multiple sets of staggered electrodes in a three-phase connection." (Office Action, pages 2-3). The Examiner then concludes that "it would have been obvious to modify the patent to Chism, Jr. et al to use multiple sets of electrodes connected to the three phase power supplies, as claimed, to enable a more uniform, efficient and longitudinally maintained heating zone." (Office Action, page 3). Applicants respectfully traverse this rejection.

As set forth hereinabove, Chism discloses a plasma generator that includes three primary electrodes (33a-33c) that are spaced circumferentially around the chamber, the electrodes being configured as bent, conductive tubes having a coolant circulating therethrough. An annular pneumatic ring, having a plurality of concentric holes formed therein, is disposed inside the housing of the plasma generator. (Col. 3, lines 13 – 22). The annular ring is configured to direct flow of a working gas in a clockwise direction to create a highly turbulent gas flow, to allow the gas to blow around the electrodes evenly from all sides, (see, e.g., col. 3, lines 63-65), and to force the plasma away from the walls of the chamber (see, e.g., col. 5, lines 10-12). An arc is initiated among the primary electrodes by introducing a highly ionized gas into the gap

therebetween, the ionized gas having been produced by a high voltage oscillator. (Col. 3, line 66 – col. 4, line 14).

As also discussed hereinabove, Williamson discloses a glass melting furnace having three groups of electrodes, each group of electrodes representing a zone of the furnace. The electrodes are arranged in a very specific manner regarding both the physical and the electrical configurations of the electrodes.

Particularly, Williamson describes two transformers (T1 and T2) that are both connected to a three phase electrical supply. The output terminals of the transformers are connected to electrode pairs such that each leg/phase of the transformer output is connected to one electrode pair of each of the three zones (see, e.g., FIGS. 1 and 3). The physical and electrical configuration of these electrode groups is stated to minimize undesirable current paths so that the groups or zones of electrodes may be physically placed in a relatively close proximity to each other. (Col. 2, lines 24-57).

Applicants submit that the proposed combination of Chism and Williamson fails to teach or suggest all of the limitations of claim 39 of the presently claimed invention. For example, Chism and Williamson fail to teach or suggest at least another set of electrodes comprising three electrodes, wherein *each electrode of the at least another set of elect*rodes is configured to be coupled to a *single phase* of *another three phase alternating current (AC) supply*. Rather, as set forth hereinabove, Williamson, which the Examiner relies on as teaching multiple sets of electrodes, teaches a specific arrangement of electrodes and power supplies wherein the output terminals of the transformers are connected to electrode pairs such that *each leg/phase of the transformer output is connected to one discrete electrode pair for each of the three zones*.

Additionally, Chism and Williamson fail to teach or suggest that the three electrodes of the at least another set of electrodes are *circumferentially disposed about the longitudinal axis of the chamber body* and also *displaced from the first set of electrodes along the longitudinal axis*. Again, while the Examiner relies on Williamson as teaching multiple sets of electrodes arranged in zones, Williamson does not teach or suggest that the electrodes of one zone are circumferentially arranged about a longitudinal axis of the chamber body while the electrodes of

another zone are likewise circumferentially arranged about the longitudinal axis and also *displaced along the longitudinal axis relative to the first set of electrodes.*

Moreover, Applicants submit that there is a lack of motivation for combining the references in the manner proposed by the Examiner. It is noted that, in order to arrive at the claimed invention, the physical and electrical arrangement of Williamson would have to be substantially modified such that each of the electrodes of one zone would be coupled with individual phases of one three phase AC supply while the electrodes of another zone would be coupled with individual phases of a different three phase AC supply. Such would render the furnace of Williamson inadequate for its intended purpose as Williamson's specifically disclosed arrangements are expressly described as enabling the close spacing of the different zones while minimizing unwanted current paths between such zones.

Applicants, therefore, submit that claim 39 is allowable over Chism and Williamson. Applicants further submit that claims 50 through 52 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claim 50, Applicants submit that Chism and Williamson fail to teach or suggest a first chamber section and at least another chamber section that are removably coupled with each other.

With respect to claim 51, Applicants submit that Chism and Williamson fail to teach or suggest that the at least another chamber section includes a second chamber section removably coupled to the first chamber section and a third chamber section removably coupled to the second chamber section, and that the at least another set of electrodes includes a second set of electrodes disposed at least partially within the second chamber section and a third set of electrodes disposed at least partially within the third chamber section.

With respect to claim 52, Applicants submit that Chism and Williamson fail to teach or suggest a spacer disposed between and removably coupled to each of the first chamber section and the at least another chamber section.

Applicants, therefore, respectfully request reconsideration and allowance of claims 39 and 50 through 52.

Claims 53 through 60

Independent claim 53 is directed to a system for processing materials. As amended herein the system of claim 53 comprises: a chamber having an inlet at a first end thereof and an outlet at a second end thereof; a first set of electrodes comprising three electrodes, the three electrodes of the first set of electrodes being circumferentially disposed about a longitudinal axis of the chamber; at least another set of electrodes comprising three electrodes, *the three electrodes of the at least another set of electrodes being circumferentially disposed about the longitudinal axis of the chamber, and wherein the at least another set of electrodes is displaced along the longitudinal axis relative to the first set of electrodes*; a first power supply including three-phase alternating current (AC) electrical service wherein each phase of the first power supply is coupled to an individual electrode of the first set of electrodes; *at least another power supply including three-phase AC electrical service wherein each phase of the at least another power supply is coupled to an individual electrode of the at least another set of electrodes.*

The Examiner cites Chism as teaching "three phase energization of the plasma" and states that Chism fails to disclose "multiple sets of electrodes in multiple zones." (Office Action, page 2). The Examiner cites Williamson as teaching that it is "conventional in a plasma furnace to have multiple sets of staggered electrodes in a three-phase connection." (Office Action, pages 2-3). The Examiner then concludes that "it would have been obvious to modify the patent to Chism, Jr. et al to use multiple sets of electrodes connected to the three phase power supplies, as claimed, to enable a more uniform, efficient and longitudinally maintained heating zone." (Office Action, page 3). Applicants respectfully traverse this rejection.

As set forth hereinabove, Chism discloses a plasma generator that includes three primary electrodes (33a-33c) that are spaced circumferentially around the chamber, the electrodes being configured as bent, conductive tubes having a coolant circulating therethrough. An annular pneumatic ring, having a plurality of concentric holes formed therein, is disposed inside the housing of the plasma generator. (Col. 3, lines 13 – 22). The annular ring is configured to direct flow of a working gas in a clockwise direction to create a highly turbulent gas flow, to allow the gas to blow around the electrodes evenly from all sides, (see, e.g., col. 3, lines 63-65), and to force the plasma away from the walls of the chamber (see, e.g., col. 5, lines 10-12). An arc is

initiated among the primary electrodes by introducing a highly ionized gas into the gap therebetween, the ionized gas having been produced by a high voltage oscillator. (Col. 3, line 66 – col. 4, line 14).

As also discussed hereinabove, Williamson discloses a glass melting furnace having three groups of electrodes, each group of electrodes representing a zone of the furnace. The electrodes are arranged in a very specific manner regarding both the physical and the electrical configurations of the electrodes.

Particularly, Williamson describes two transformers (T1 and T2) that are both connected to a three phase electrical supply. The output terminals of the transformers are connected to electrode pairs such that each leg/phase of the transformer output is connected to one electrode pair of each of the three zones (see, e.g., FIGS. 1 and 3). The physical and electrical configuration of these electrode groups is stated to minimize undesirable current paths so that the groups or zones of electrodes may be physically placed in a relatively close proximity to each other. (Col. 2, lines 24-57).

Applicants submit that the proposed combination of Chism and Williamson fails to teach or suggest all of the limitations of claim 53 of the presently claimed invention. For example, Chism and Williamson fail to teach or suggest a first power supply including three-phase alternating current (AC) electrical service wherein each phase of the first power supply is coupled to an individual electrode of the first set of electrodes and *at least another power supply including three-phase AC electrical service wherein each phase of the at least another power supply is coupled to an individual electrode of the at least another set of electrodes*. Rather, as set forth hereinabove, Williamson, which the Examiner relies on as teaching multiple sets of electrodes, teaches a specific arrangement of electrodes and power supplies wherein the output terminals of the transformers are connected to electrode pairs such that *each leg/phase of the transformer output is connected to one discrete electrode pair for each of the three zones*.

Additionally, Chism and Williamson fail to teach or suggest that the three electrodes of the at least another set of electrodes are *circumferentially disposed about the longitudinal axis of the chamber body*, and also *displaced along the longitudinal axis relative to the first set of electrodes*. Again, while the Examiner relies on Williamson as teaching multiple sets of

electrodes arranged in zones, Williamson does not teach or suggest that the electrodes of one zone are circumferentially arranged about a longitudinal axis of the chamber body while the electrodes of another zone are likewise circumferentially arranged about the longitudinal axis and also *displaced along the longitudinal axis relative to the first set of electrodes.*

Moreover, Applicants submit that there is a lack of motivation for combining the references in the manner proposed by the Examiner. It is noted that, in order to arrive at the claimed invention, the physical and electrical arrangement of Williamson would have to be substantially modified such that each of the electrodes of one zone would be coupled with individual phases of one three phase AC supply while the electrodes of another zone would be coupled with individual phases of a different three phase AC supply. Such would render the furnace of Williamson inadequate for its intended purpose as Williamson's specifically disclosed arrangements are expressly described as enabling the close spacing of the different zones while minimizing unwanted current paths between such zones.

Applicants, therefore, submit that claim 53 is allowable over Chism and Williamson. Applicants further submit that claims 54 through 60 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claims 57 through 60, Applicants submit that Chism and Williamson fail to teach or suggest that either the first power supply or the second power supply include a silicon controlled rectifier.

Applicants, therefore, respectfully request reconsideration and allowance of claims 53 through 60.

Claims 73 through 75

Independent claim 73 is directed to a method of generating a plasma. As amended herein the method of claim 73 comprises: introducing a gas into a chamber; providing a first set of electrodes including circumferentially disposing three electrodes about a longitudinal axis of the chamber; providing at least another set of electrodes including circumferentially *disposing three electrodes about the longitudinal axis and displaced along the longitudinal axis relative to the first set of electrodes*; coupling the first set of electrodes to a first power supply including

coupling each electrode of the first set of electrodes to a phase of a three-phase alternating current (AC) power supply; *coupling the at least another set of electrodes to at least another power supply including coupling each electrode of the at least another set of electrodes to a phase of at least another three-phase power supply*; creating an arc among the first set of electrodes and the at least another set of electrodes within the chamber in the presence of the gas.

The Examiner cites Chism as teaching "three phase energization of the plasma" and states that Chism fails to disclose "multiple sets of electrodes in multiple zones." (Office Action, page 2). The Examiner cites Williamson as teaching that it is "conventional in a plasma furnace to have multiple sets of staggered electrodes in a three-phase connection." (Office Action, pages 2-3). The Examiner then concludes that "it would have been obvious to modify the patent to Chism, Jr. et al to use multiple sets of electrodes connected to the three phase power supplies, as claimed, to enable a more uniform, efficient and longitudinally maintained heating zone." (Office Action, page 3). Applicants respectfully traverse this rejection.

As set forth hereinabove, Chism discloses a plasma generator that includes three primary electrodes (33a-33c) that are spaced circumferentially around the chamber, the electrodes being configured as bent, conductive tubes having a coolant circulating therethrough. An annular pneumatic ring, having a plurality of concentric holes formed therein, is disposed inside the housing of the plasma generator. (Col. 3, lines 13 – 22). The annular ring is configured to direct flow of a working gas in a clockwise direction to create a highly turbulent gas flow, to allow the gas to blow around the electrodes evenly from all sides, (see, e.g., col. 3, lines 63-65), and to force the plasma away from the walls of the chamber (see, e.g., col. 5, lines 10-12). An arc is initiated among the primary electrodes by introducing a highly ionized gas into the gap therebetween, the ionized gas having been produced by a high voltage oscillator. (Col. 3, line 66 – col. 4, line 14).

As also discussed hereinabove, Williamson discloses a glass melting furnace having three groups of electrodes, each group of electrodes representing a zone of the furnace. The electrodes are arranged in a very specific manner regarding both the physical and the electrical configurations of the electrodes.

Particularly, Williamson describes two transformers (T1 and T2) that are both connected

to a three phase electrical supply. The output terminals of the transformers are connected to electrode pairs such that each leg/phase of the transformer output is connected to one electrode pair of each of the three zones (see, e.g., FIGS. 1 and 3). The physical and electrical configuration of these electrode groups is stated to minimize undesirable current paths so that the groups or zones of electrodes may be physically placed in a relatively close proximity to each other. (Col. 2, lines 24-57).

Applicants submit that the proposed combination of Chism and Williamson fails to teach or suggest all of the limitations of claim 73 of the presently claimed invention. For example, Chism and Williamson fail to teach or suggest coupling the first set of electrodes to a first power supply including coupling each electrode of the first set of electrodes to a phase of a three-phase alternating current (AC) power supply and *coupling the at least another set of electrodes to at least another power supply including coupling each electrode of the at least another set of electrodes to a phase of at least another three-phase power supply.* Rather, as set forth hereinabove, Williamson, which the Examiner relies on as teaching multiple sets of electrodes, teaches a specific arrangement of electrodes and power supplies wherein the output terminals of the transformers are connected to electrode pairs such that *each leg/phase of the transformer output is connected to one discrete electrode pair for each of the three zones.*

Additionally, Chism and Williamson fail to teach or suggest providing at least another set of electrodes including circumferentially *disposing three electrodes about the longitudinal axis and displaced along the longitudinal axis relative to the first set of electrodes.* Again, while the Examiner relies on Williamson as teaching multiple sets of electrodes arranged in zones, Williamson does not teach or suggest that the electrodes of one zone are circumferentially arranged about a longitudinal axis of the chamber body, while the electrodes of another zone are likewise circumferentially arranged about the longitudinal axis and also *displaced along the longitudinal axis relative to the first set of electrodes.*

Moreover, Applicants submit that there is a lack of motivation for combining the references in the manner proposed by the Examiner. It is noted that, in order to arrive at the claimed invention, the physical and electrical arrangement of Williamson would have to be substantially modified such that each of the electrodes of one zone would be coupled with individual phases of

one three phase AC supply while the electrodes of another zone would be coupled with individual phases of a different three phase AC supply. Such would render the furnace of Williamson inadequate for its intended purpose as Williamson's specifically disclosed arrangements are expressly described as enabling the close spacing of the different zones while minimizing unwanted current paths between such zones.

Applicants, therefore, submit that claim 73 is allowable over Chism and Williamson. Applicants further submit that claims 74 and 75 are allowable at least by virtue of their dependency from an allowable base claim. As such, reconsideration and allowance of claims 73 through 75 is respectfully requested.

Obviousness Rejection Based on U.S. Patent No. 5,801,489 to Chism, Jr. et al. in view of U.S. Patent No. 4,282,393 to Williamson as applied to claims above, and further in view of U.S. Patent No. 5,312,471 to Jung

Claims 5 through 17, 25 through 33, 40 through 49, 61 through 72, and 76 through 85 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chism, Jr. et al. (U.S. Patent No. 5,801,489) in view of Williamson (U.S. Patent No. 4,282,393) as applied to claims above, and further in view of Jung (U.S. Patent No. 5,312,471). Applicants respectfully traverse this rejection, as hereinafter set forth.

Claims 5 through 17

Each of claims 5 through 17 ultimately depend from independent claim 1. The Examiner relies on Chism and Williamson as applied to claim 1 and the cites Jung as disclosing electrodes that can be moved and positioned within a plasma furnace for arc control. (See Office Action, page 3). Referring to Jung, the Examiner states that "it would have been obvious to modify the Chism, Jr. et al system with the same to enable the benefit of better arc control and hence arc efficiency, and to enable replacement of electrode consumables as needed." (Office Action, page 3). Additionally, the Examiner states that "[u]se of a rod, or other means to effect such movement as defined in the dependent claims is a matter of choice for the artisan, since many schemes are available for such movement, such schemes ebullient in effect." (*Id*, pages 3-4).

As discussed hereinabove, Chism and Williamson fail to teach or suggest all of the limitations of claim 1, from which claims 5 through 17 depend. For example, Chism and Williamson fail to teach or suggest at least another set of electrodes comprising three electrodes, wherein *each electrode* of the at least another set of electrodes is configured to be coupled to a single phase of *another three phase alternating current (AC) supply.* Additionally, Chism and Williamson fail to teach or suggest that the three electrodes of the at least another set of electrodes are *circumferentially disposed about the longitudinal axis of the chamber* while also being *displaced along the longitudinal axis relative to the first set of electrodes.*

As also discussed hereinabove, Applicants submit that there is a lack of motivation to combine the Chism and Williamson in the manner proposed by the Examiner. Applicants submit that Jung fails to add to the combination of Chism and Williamson with regard to the subject matter of claim 1.

As such, Applicants submit that claims 5 through 17 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claims 5 through 17, Applicants submit that the references relied upon by the Examiner fail to teach or suggest a first set of electrodes circumferentially disposed about a longitudinal axis, each of which is configured to be *radially displaced relative to the longitudinal axis.*

With respect to claims 6 through 17, Applicants submit that the references relied upon by the Examiner fail to teach or suggest at least another set of electrodes circumferentially disposed about a longitudinal axis, each of which is configured to be *radially displaced relative to the longitudinal axis.*

With respect to claim 8, while the Examiner has asserted that "use of a rod, or other means" is a matter of choice for the artisan, Applicants note that such structures do not appear to be taught or suggested in any of the references relied upon by the Examiner, nor has the Examiner cited any specific source as showing such components being conventional in the claimed context as asserted by the Examiner.

With respect to claims 13 through 17, Applicants submit that the references relied upon by the Examiner fail to teach or suggest that each electrode of the first set of electrodes extends at an acute angle relative to the longitudinal axis and that each electrode of the at least another set of electrodes extends at a substantially normal angle relative to the longitudinal axis.

With respect to claims 16 and 17, Applicants submit that the references relied upon by the Examiner fail to teach or suggest that each of the first set of electrodes is disposed circumferentially about the longitudinal axis at an angle of approximately 120° relative to adjacent electrodes of the first set of electrodes and exhibit a first circumferential orientation about the longitudinal axis, and that each electrode of the at least another set of electrodes is disposed circumferentially about the longitudinal axis at an angle of approximately 120° relative to adjacent electrodes of the at least another set of electrodes while exhibiting a second circumferential orientation about the longitudinal axis different from the first circumferential orientation.

With respect to claim 17, Applicants submit that the references relied upon by the Examiner fail to teach or suggest that the second circumferential orientation includes the electrodes of the at least another set of electrodes being rotated approximately 60° about the longitudinal axis relative to the electrodes of the first set of electrodes.

Applicants, therefore, respectfully request reconsideration and allowance of claims 5 through 17.

Claims 25 through 33

Each of claims 25 through 33 ultimately depend from independent claim 24. The Examiner relies on Chism and Williamson as applied to claim 24 and then cites Jung as disclosing electrodes that can be moved and positioned within a plasma furnace for arc control. (See Office Action, page 3). Referring to Jung, the Examiner states that "it would have been obvious to modify the Chism, Jr. et al system with the same to enable the benefit of better arc control and hence arc efficiency, and to enable replacement of electrode consumables as needed." (Office Action, page 3).

As discussed hereinabove, Chism and Williamson fail to teach or suggest all of the

limitations of claim 24, from which claims 25 through 33 depend. For example, Chism and Williamson fail to teach or suggest at least another set of electrodes comprising three electrodes, wherein *each electrode* of the at least another set of electrodes is configured to be coupled to a single phase of *another three phase alternating current (AC) supply*. Additionally, Chism and Williamson fail to teach or suggest that the three electrodes of the at least another set of electrodes are *circumferentially disposed about the defined axis* while also being *displaced from the first set of electrodes along the defined axis*.

As also discussed hereinabove, Applicants submit that there is a lack of motivation to combine the Chism and Williamson in the manner proposed by the Examiner. Applicants submit that Jung fails to add to the combination of Chism and Williamson with regard to the subject matter of claim 24.

As such, Applicants submit that claims 25 through 33 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claims 25 through 33, Applicants submit that the references relied upon by the Examiner fail to teach or suggest the arc generating apparatus defined in claim 24 which includes a first set of electrodes circumferentially disposed about a defined axis, each of which is configured to be *radially displaced relative to the defined axis*.

With respect to claims 26 through 33, Applicants submit that the references relied upon by the Examiner fail to teach or suggest at least another set of electrodes circumferentially disposed about the defined axis, each of which is configured to be *radially displaced relative to the defined axis*.

With respect to claims 28 through 33, Applicants submit that the references relied upon by the Examiner fail to teach or suggest that each electrode of the first set of electrodes extends at an acute angle relative to the defined axis and that each electrode of the at least another set of electrodes extends at a substantially normal angle relative to the defined axis.

With respect to claims 31 through 33, Applicants submit that the references relied upon by the Examiner fail to teach or suggest that each of the first set of electrodes is disposed circumferentially about the defined axis at an angle of approximately 120° relative to adjacent

electrodes of the first set of electrodes and exhibit a first circumferential orientation about the defined axis, and that each electrode of the at least another set of electrodes is disposed circumferentially about the defined axis at an angle of approximately 120° relative to adjacent electrodes of the at least another set of electrodes while exhibiting a second circumferential orientation about the defined axis different from the first circumferential orientation.

With respect to claim 32, Applicants submit that the references relied upon by the Examiner fail to teach or suggest that the second circumferential orientation includes the electrodes of the at least another set of electrodes being rotated approximately 60° about the longitudinal axis relative to the electrodes of the first set of electrodes.

With respect to claim 33, Applicants submit that the references relied upon by the Examiner fail to teach or suggest the sets of electrodes as defined by claim 24 wherein the at least another set of electrodes includes a second set of electrodes and a third set of electrodes displaced along the defined axis relative to the second set of electrodes.

Applicants, therefore, respectfully request reconsideration and allowance of claims 25 through 33.

Claims 40 through 49

Each of claims 40 through 49 ultimately depend from independent claim 39. The Examiner relies on Chism and Williamson as applied to claim 39 and then cites Jung as disclosing electrodes that can be moved and positioned within a plasma furnace for arc control. (See Office Action, page 3). Referring to Jung, the Examiner states that "it would have been obvious to modify the Chism, Jr. et al system with the same to enable the benefit of better arc control and hence arc efficiency, and to enable replacement of electrode consumables as needed." (Office Action, page 3).

As discussed hereinabove, Chism and Williamson fail to teach or suggest all of the limitations of claim 39, from which claims 40 through 49 depend. For example, Chism and Williamson fail to teach or suggest at least another set of electrodes comprising three electrodes, wherein *each electrode* of the at least another set of electrodes is configured to be coupled to a single phase of *another three phase alternating current (AC) supply*. Additionally, Chism and

Williamson fail to teach or suggest that the three electrodes of the at least another set of electrodes are *circumferentially disposed about the longitudinal axis of the chamber body*, and also *displaced along the longitudinal axis relative to the first set of electrodes*.

As also discussed hereinabove, Applicants submit that there is a lack of motivation to combine the Chism and Williamson in the manner proposed by the Examiner. Applicants submit that Jung fails to add to the combination of Chism and Williamson with regard to the subject matter of claim 39.

As such, Applicants submit that claims 40 through 49 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claims 40 through 49, Applicants submit that the references relied upon by the Examiner fail to teach or suggest a first set of electrodes circumferentially disposed about a longitudinal axis, each of which is configured to be *radially displaced relative to the longitudinal axis*.

With respect to claims 41 through 49, Applicants submit that the references relied upon by the Examiner fail to teach or suggest at least another set of electrodes circumferentially disposed about a longitudinal axis, each of which is configured to be *radially displaced relative to the longitudinal axis*.

With respect to claims 48 and 49, Applicants submit that the references relied upon by the Examiner fail to teach or suggest that each electrode of the first set of electrodes extends at an acute angle relative to the longitudinal axis and that each electrode of the at least another set of electrodes extends at a substantially normal angle relative to the longitudinal axis.

Applicants, therefore, respectfully request reconsideration and allowance of claims 40 through 49.

Claims 61 through 72

Each of claims 61 through 72 ultimately depend from independent claim 53. The Examiner relies on Chism and Williamson as applied to claim 53 and then cites Jung as disclosing electrodes that can be moved and positioned within a plasma furnace for arc control.

(See Office Action, page 3). Referring to Jung, the Examiner states that "it would have been obvious to modify the Chism, Jr. et al system with the same to enable the benefit of better arc control and hence arc efficiency, and to enable replacement of electrode consumables as needed." (Office Action, page 3).

As discussed hereinabove, Chism and Williamson fail to teach or suggest all of the limitations of claim 53, from which claims 61 through 72 depend. For example, Chism and Williamson fail to teach or suggest a first power supply including three-phase alternating current (AC) electrical service wherein each phase of the first power supply is coupled to an individual electrode of the first set of electrodes and *at least another power supply including three-phase AC electrical service wherein each phase of the at least another power supply is coupled to an individual electrode of the at least another set of electrodes*. Additionally, Chism and Williamson fail to teach or suggest that the three electrodes of the at least another set of electrodes are *circumferentially disposed about the longitudinal axis of the chamber* while also *displaced along the longitudinal axis relative to the first set of electrodes*.

As also discussed hereinabove, Applicants submit that there is a lack of motivation to combine the Chism and Williamson in the manner proposed by the Examiner. Applicants submit that Jung fails to add to the combination of Chism and Williamson with regard to the subject matter of claim 53.

As such, Applicants submit that claims 61 through 72 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claims 61 through 72, Applicants submit that the references relied upon by the Examiner fail to teach or suggest a first set of electrodes circumferentially disposed about a longitudinal axis, each of which is configured to be *radially displaced relative to the longitudinal axis*.

With respect to claims 62 through 72, Applicants submit that the references relied upon by the Examiner fail to teach or suggest at least another set of electrodes circumferentially disposed about a longitudinal axis, each of which is configured to be *radially displaced relative to the longitudinal axis*.

With respect to claims 65 through 72, Applicants submit that the references relied upon by the Examiner fail to teach or suggest: a plurality of actuators, wherein each electrode of the first set of electrodes and each electrode of the at least another set of electrodes is coupled with an actuator of the plurality of actuators and displaceable thereby; a first measurement device located and configured to determine at least one of a current and a voltage of each phase of the first power supply and produce a first signal responsive thereto, and at least one other measurement device located and configured to determined at least one of a current an a voltage of each phase of the at least another power supply and produce at least another signal responsive thereto, *wherein the plurality of actuators are each configured to displace their associated electrodes responsive to at least one of the first signal and the at least another signal.*

With respect to claims 71 and 72, Applicants submit that the references relied upon by the Examiner fail to teach or suggest that each electrode of the first set of electrodes extends at an acute angle relative to the longitudinal axis and that each electrode of the at least another set of electrodes extends at a substantially normal angle relative to the longitudinal axis.

With respect to claims 72, Applicants submit that the references relied upon by the Examiner fail to teach or suggest that the first set of electrodes exhibit a first circumferential orientation about the longitudinal axis, and that the at least another set of electrodes exhibits a second circumferential orientation about the longitudinal axis different from the first circumferential orientation.

Applicants, therefore, respectfully request reconsideration and allowance of claims 61 through 72.

Claims 76 through 80

Each of claims 76 through 80 ultimately depend from independent claim 73. The Examiner relies on Chism and Williamson as applied to claim 73 and then cites Jung as disclosing electrodes that can be moved and positioned within a plasma furnace for arc control. (See Office Action, page 3). Referring to Jung, the Examiner states that "it would have been obvious to modify the Chism, Jr. et al system with the same to enable the benefit of better arc control and hence arc efficiency, and to enable replacement of electrode consumables as needed."

(Office Action, page 3).

As discussed hereinabove, Chism and Williamson fail to teach or suggest all of the limitations of claim 73, from which claims 76 through 80 depend. For example, Chism and Williamson fail to teach or suggest coupling the first set of electrodes to a first power supply including coupling each electrode of the first set of electrodes to a phase of a three-phase alternating current (AC) power supply and *coupling the at least another set of electrodes to at least another power supply including coupling each electrode of the at least another set of electrodes to a phase of at least another three-phase power supply*. Additionally, Chism and Williamson fail to teach or suggest providing at least another set of electrodes including circumferentially *disposing three electrodes about the longitudinal axis and displaced along the longitudinal axis relative to the first set of electrodes*.

As also discussed hereinabove, Applicants submit that there is a lack of motivation to combine the Chism and Williamson in the manner proposed by the Examiner. Applicants submit that Jung fails to add to the combination of Chism and Williamson with regard to the subject matter of claim 73.

As such, Applicants submit that claims 76 through 80 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claims 76 through 80, Applicants submit that the references relied upon by the Examiner fail to teach or suggest displacing at least one electrode of the first set of electrodes responsive to at least one determined operational characteristic of the first power supply.

With respect to claims 77 through 80, Applicants submit that the references relied upon by the Examiner fail to teach or suggest displacing at least one electrode of the at least another set of electrodes responsive to at least one determined operational characteristic of the at least another power supply.

Applicants, therefore, respectfully request reconsideration and allowance of claims 76 through 80.

Claims 81 through 85

Independent claim 81 is directed to a method of generating a plasma. As amended herein the method of claim 81 comprises: introducing a gas into a chamber; disposing at least a first plurality of electrodes at least partially within the chamber in a first circumferential arrangement about a longitudinal axis of the chamber such that a tip of at least one electrode is disposed a first distance from a tip of an adjacent electrode; creating an arc among the at least a first plurality of electrodes in the chamber in the presence of a gas; and *displacing the at least one electrode radially with respect to the longitudinal axis such that the tip of the at least one electrode is disposed at a second distance from the tip of the adjacent electrode while maintaining the arc.*

The Examiner cites Chism as teaching "three phase energization of the plasma" while noting that Chism fails to disclose "multiple sets of electrodes in multiple zones." (Office Action, page 2). The Examiner cites Williamson as teaching that it is "conventional in a plasma furnace to have multiple sets of staggered electrodes in a three-phase connection." (Office Action, pages 2-3). Additionally, the Examiner cites Jung as disclosing electrodes that can be moved and positioned within a plasma furnace for arc control. (See Office Action, page 3). Referring to Jung, the Examiner states that "it would have been obvious to modify the Chism, Jr. et al system with the same to enable the benefit of better arc control and hence arc efficiency, and to enable replacement of electrode consumables as needed." (Office Action, page 3). Applicants respectfully traverse this rejection.

As set forth hereinabove, Chism discloses a plasma generator that includes three primary electrodes (33a-33c) that are spaced circumferentially around the chamber, the electrodes being configured as bent, conductive tubes having a coolant circulating therethrough. An annular pneumatic ring, having a plurality of concentric holes formed therein, is disposed inside the housing of the plasma generator. (Col. 3, lines 13 – 22). The annular ring is configured to direct flow of a working gas in a clockwise direction to create a highly turbulent gas flow, to allow the gas to blow around the electrodes evenly from all sides, (see, e.g., col. 3, lines 63-65), and to force the plasma away from the walls of the chamber (see, e.g., col. 5, lines 10-12). An arc is initiated among the primary electrodes by introducing a highly ionized gas into the gap therebetween, the ionized gas having been produced by a high voltage oscillator. (Col. 3, line 66

– col. 4, line 14).

As also discussed hereinabove, Williamson discloses a glass melting furnace having three groups of electrodes, each group of electrodes representing a zone of the furnace. The electrodes of each zone are arranged in a substantially square pattern and the exemplary flow path within the furnace is indicated by an arrow in the drawings as concurrently flowing across all of the zones. Williamson teaches a very specific arrangement regarding both the physical and the electrical configurations of the electrodes.

Particularly, Williamson describes two transformers (T1 and T2) that are both connected to a three phase electrical supply. The output terminals of the transformers are connected to electrode pairs such that each leg/phase of the transformer output is connected to one electrode pair of each of the three zones (see, e.g., FIGS. 1 and 3). The physical and electrical configuration of these electrode groups is stated to minimize undesirable currents such that the groups or zones of electrodes may be physically placed in a relatively close proximity to each other. (Col. 2, lines 24-57).

Jung discloses a rotary furnace for melting particulate SiO_2 and fabricating optical grade glass preforms. The furnace includes a cylindrical section with flanged covers at each end thereof. The flanged covers are penetrated by "non-rotating, but linearly movable, hollow water –cooled electrodes 28, 29" that are coupled with a DC power source. The electrodes are disposed along an axis of rotation of the cylinder and are configured to be displaced along the axis of rotation towards or away from one another. (See col. 9, lines 24-51). The electrodes are hollow such that an appropriate gas, as well as particulate SiO_2, may be introduced therethrough.

The cylinder rotates as the particulate feed enters the plasma and is melted. The melted SiO_2 is evenly distributed about the cylindrical housing so as to form a cylindrical melt. (See col. 10, lines 32-38; col. 11, lines 6-16).

However, Applicants submit that Chism, Williamson and Jung fail to teach or suggest displacing the at least one electrode *radially with respect to the longitudinal* axis such that the tip of the at least one electrode is disposed at a second distance from the tip of the adjacent electrode while maintaining the arc. Additionally, Applicants submit that there is a lack of motivation to combine the references in the manner proposed by the Examiner. As discussed hereinabove,

there is a lack of motivation to combine Chism and Williamson. Applicants further submit that there is a lack of motivation to combine the teachings of Jung with those of Chism and Williamson as Jung discloses a specific plasma furnace utilized to form a cylindrical melt. The furnace is disclosed to use *two* electrodes supplied with *DC electricity* and which are necessarily *collinear with the longitudinal axis, or axis of rotation,* of the cylindrical housing. Applicants submit that one of ordinary skill in the art would lack motivation to combine the references as proposed by the Examiner based on the substantially different apparatuses taught by each.

Furthermore, Applicants note that the electrodes of Chism have two points of entry each through the associated housing. Configuring such electrodes to be displaced towards or away from each other as proposed by the Examiner would require enlarged openings in the housing and substantial design modifications further discouraging one of ordinary skill in the art from combining the references in the manner proposed by the Examiner.

Additionally, Applicants note that the motivation to combine must come from the references themselves or from the knowledge of one of ordinary skill in the art. Applicants submit any suggestion or motivation to combine the references as proposed by the Examiner is lacking from the references themselves.

Applicants, therefore, submit that claim 81 is allowable over the cited combination of Chism, Williamson and Jung. Applicants further submit that claims 82 through 85 are also allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claim 84, Applicants submit that the references relied upon by the Examiner fail to teach or suggest determining at least one operational parameter associated with the electrical service provided to each electrode *wherein the displacing each electrode is responsive to the determined at least one operational parameter*. While Jung teaches that the electrodes may be displaced away from each other upon initiation of an arc, it does not say that such displacement is responsive to an operational parameter of the electrical service that has been determined.

With respect to claim 85, Applicants submit that the references relied upon by the Examiner fail to teach or suggest circumferentially disposing a first set of electrodes at a first

location along the longitudinal axis and circumferentially disposing at least a second set of electrodes at a second location along the longitudinal axis displaced from the first location.

Applicants, therefore, respectfully request reconsideration and allowance of claims 81 through 85.

ENTRY OF AMENDMENTS

The amendments to claims 1, 5, 6, 21, 24-26, 36, 39-41, 52, 53, 61, 62, 73, 81, 82 and 85 above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application. Further, the amendments do not raise new issues or require a further search.

CONCLUSION

Claims 1 through 85 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, the Examiner is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,

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